

Preface

Although concepts that we now consider as part of topology had been expressed and used by mathematicians in the nineteenth century (in particular, by Riemann, Klein, and Poincaré), algebraic topology as a part of rigorous mathematics (i.e., with precise definitions and correct proofs) only began in 1900. At first, algebraic topology grew very slowly and did not attract many mathematicians; until 1920 its applications to other parts of mathematics were very scanty (and often shaky). This situation gradually changed with the introduction of more powerful algebraic tools, and Poincaré's vision of the fundamental role topology should play in all mathematical theories began to materialize. Since 1940, the growth of algebraic and differential topology and of its applications has been exponential and shows no sign of slackening.

I have tried in this book to describe the main events in that expansion prior to 1960. The choice of that terminal date does not correspond to any particular occurrence nor to an inflection in the development of the theory. However, on one hand, I wanted to limit the size of this book, which is already a large one; and, on the other hand, it is difficult to have a bird's eye view of an evolution that is still going on around us at an unabated pace. Twenty years from now it will be much easier to describe what happened between 1960 and 1980, and it will probably fill a book as large as this one.

There is one part of the history of algebraic and differential topology that I have not covered at all, namely, that which is called "low-dimensional topology." It was soon realized that some general tools could not give satisfactory results in spaces of dimension 4 at most, and, conversely, methods that were successful for those spaces did not extend to higher dimensions. I feel that a description of the discovery of the properties of these spaces deserves a book by itself, which I hope somebody will write soon.

The literature on algebraic and differential topology is very large, and to analyze each paper would have been unbearably boring. I have tried to focus the history on the emergence of ideas and methods opening new fields of research, and I have gone into some details on the work of the pioneers, even when their methods were later superseded by simpler and more powerful ones. As Hadamard once said, in mathematics simple ideas usually come last.

I assume that the reader is familiar with the elementary part of algebra and “general topology.” Whenever I have had to mention striking applications of algebraic topology to other parts of mathematics, I have summarized the notions necessary to understand these applications.

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